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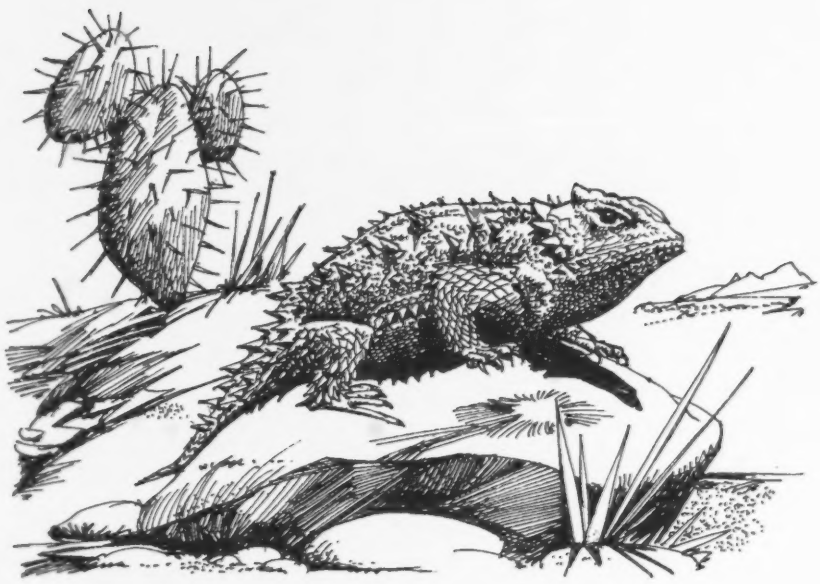
Short-Horned Lizard (*Phrynosoma hernandesi hernandesi*) Populations in Alberta – 2002 Survey Results



Alberta Species at Risk Report No. 65

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

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Short-Horned Lizard (*Phrynosoma hernandesi hernandesi*) Populations in Alberta – 2002 Survey Results

Janice D. James

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Surveys of species with small distributions and even smaller home ranges require the cooperation of the landowners and leaseholders. We extend many thanks to these generous individuals for their permission to survey their property for this species.

DISCLAIMER

The views and opinions expressed are those of the author(s) and do not necessarily represent the policies or positions of the Department or the Alberta Government.

EXECUTIVE SUMMARY

Short-horned lizards are one of several species that reach the northernmost extent of their distribution in the province of Alberta. Such populations are of particular importance due to their adaptation to this extreme environment. Short-horned lizards in Alberta are found in relatively small and disjunct sub-populations that are sparsely distributed over a broad area of the southeastern corner of the province.

An effort to search and verify presence of lizards at all sites where they were previously recorded in Alberta was undertaken in 2001. The objectives of the survey this year was to complete the search effort put forth in 2001. However, unprecedented cold and wet weather conditions drastically hindered attempts to search for lizards in late July and August of 2002. Primarily due to this factor, just eight additional sites (15 sections) were searched, and only 5 animals captured, all at one site. This outcome contrasts sharply with the 125 captures made in 2001. In total, 59 individual sections were searched in July and August of 2001 and 2002. Lizards were captured on 19 of these sections. This low number of sections with a verified presence of lizards, in combination with anecdotal evidence, suggests that the overall distribution of this species has contracted within Alberta. Survey effort information from 2001 implies that lizard populations, at the sites that they persist, seem relatively stable.

1.0 INTRODUCTION

In 2001 the Alberta Fish and Wildlife Division initiated a project to survey all previously recorded locations of short-horned lizards in Alberta. Due to limited manpower, the cryptic nature of these small animals, and the gigantic area to be searched by foot, the study did not manage to survey all previously recorded locations within the allotted time. The survey was continued in July and August of 2002 in an effort to complete the initial endeavor.

However, the 2002 survey effort occurred under vastly different environmental conditions than those that prevailed in the hot and dry summer of 2001. Heavy spring rains and snowfalls in May of 2002 provided moisture for lush vegetative growth, and re-filled dugouts and long-dried sloughs. The resulting ecological productivity stood in stark contrast with the drought-afflicted summer of the previous year. In addition, August and September of 2002 turned out to be cool and relatively wet, with few appropriate days for lizard-searching. This ultimately hampered the 2002 field survey. For background information on short-horned lizards and complete details of survey methodology, please refer to James (2002).

2.0 RESULTS

Although July 2002 was one of the warmest and driest months ever recorded in Alberta, the last few days of the month, when the survey was to begin, were substantially below normal temperature. Searching for lizards is impractical in conditions of low daytime temperatures and heavy cloud cover, as they cannot be active under such conditions and are therefore impossible to detect. Odd summer conditions prevailed for much of the remainder of August and September, with a majority of cool and cloudy days, often with light scattered showers, only occasionally followed by a few intermittently sunny and warm days.

The limiting weather conditions greatly impacted the number of appropriate days for searching within the suitable time window around parturition. In addition, the incidence of rain showers was often enough to prevent adequate drying of access roads between moisture events which further compounded the problem. Primarily due to this restrictive factor, the total number of days spent searching in 2002 was far less than originally anticipated, as searchers could not afford to wait out the weather, and eventually had to move on to other priorities.

A total of eight sites, comprising 15 sections, in whole or part, were searched for lizards in the seven days of searching in 2002. This stands out against the 44 sections searched, either completely or partially, in 2001. Only five lizards were captured over the seven days of active searching accomplished. These five captures were caught on July 30 prior to the cold and wet weather of August. Within the seven days spent lizard hunting, the concurrent field hours (all available searchers looking at the same time) spent actively searching totaled only 23 hours 55 minutes. In contrast, the 2001 search yielded 125 lizard captures, with over 159 concurrent field hours accumulated, within a similar time span (19 days in total from July 23 - August 23, 2001). The total time spent searching in 2002 (number of searchers multiplied by number of hours spent searching) came to 88 hours. In the one location that lizards were captured a total of 6 hours 22 minutes were spent looking per capture. This is more than twice the average time per capture when compared with the 2001 survey results.

Overall, of the 74 sections previously documented as having lizard records, 48 were searched, to some extent, in 2001/2002, and lizards were captured on only 16 of these sections (33.3%). Eleven additional sections (not having previous records) were searched where they were adjacent or near to previous records, and if the habitat appeared promising. Lizards were captured on three of those additional sections searched. Hence, of the 59 sections searched in total, lizards were verified as present on only 19 of them.

3.0 DISCUSSION

There are a few contributing reasons for the low capture rate in 2002. Firstly, the vegetation was greatly enhanced due to moisture, potentially making animals harder to find. Secondly, the survey effort in 2001 focused on the sites with most recent records and best habitat, consequently, the remaining sites searched in 2002 may have been of lower quality habitat or in areas more widely affected by human impacts. Lastly, and most significantly, the 2002 survey results unquestionably reflect the poor weather conditions available during the appropriate time frame for searching for lizards.

Ecologically speaking, it may have been a beneficial year for lizards in spite of the weather. The relatively mild winter of 2001/2002 may have enhanced over-winter survival rates. The generally high biological productivity resulting from early spring moisture likely improved the available prey base. The hot, dry weather of July probably provided adequate thermal opportunities for gestation and growth. Available vegetative cover was much more abundant as plant growth was enhanced by available moisture. This factor may have reduced the probability of predation upon lizards and provided further opportunities for thermal regulation. In fact, even in the cold, wet months of August and September, lizards may not have been as thermally restricted as our limited search time would tend to indicate as activity would likely have returned to normal on the few warm days between clouds and showers.

However, several factors may have detracted from population success this year. To begin with, the cool, late spring may have delayed mating, and thus parturition. As evidence of this, the only adult female lizard found during this year's survey was still gravid on July 30. This alone is not too unusual, but no neonates were found, which suggests a later general parturition time window than last year, when neonates were discovered as early as July 24 at the Bow Island site, much further north. Delayed parturition would have placed the bulk of births within the cold wet weather of August, which was not thermally optimal for neonate survival. Neonate survival rates are likely to be generally low, but the unusual weather may have caused 2002 to be a reproductive disaster for lizards in Alberta. In addition, the cold, wet weather of the remainder of the fall likely reduced the capability of adult females to replace their fat stores prior to the onset of winter, perhaps negatively impacting the odds of successful overwintering. Lastly, although the lush vegetative growth may have reduced predation on lizards during the summer months, it may have also diminished their own mobility, perhaps important for 'migration' to overwintering sites. On top of this, animals may have been rendered relatively immobile for long periods by the cold and therefore less able to prepare for overwintering.

The restricted number of days spent searching, and low number of lizard captures in 2002, make discussion of the limited amount of data highly speculative. However, it is worth

pointing out that the capture rate, or the amount of time spent searching per capture, was very high at the Nemiscam site, relative to the average time from 2001. There are a few possible explanations for this. To begin, this was only the second day of active searching for lizards accomplished in 2002 and not all searchers were experienced, which may have contributed. As well, although this outcome varied widely from the 2001 average, the variation between sites searched in 2001 was also considerable and so the 2002 data may not represent anything out of the ordinary. Therefore, the information pertaining to the 2001 season will be taken as more reliable, and an estimate put forth that populations at those sites where lizards were captured in 2001 were approximately stable.

With regard to the total number of sections where lizards were searched for and found, the information seems rather more compelling. Lizards were only captured, and therefore verified as present, on 19 separate sections of land of the 59 searched in total. This is not a particularly high degree of success (32.2%), given that we were searching primarily on land with previous short-horned lizard records. When only those 48 sections with previous records are considered, the ratio is not much improved, as lizards were only captured on 16 of them (33.3%). A relatively low rate of presence verification is not entirely unusual for this cryptic species, but a success rate of one section in three being confirmed is certainly below that anticipated. It is primarily this information that suggests that the number of lizard sub-populations across Alberta appears to be in decline. This type of sub-population loss is widely documented in conservation biology as a common path that, if left unchecked, may lead to population extinction.

Overall, abnormal weather conditions in 2002 hampered the survey effort and likely affected lizard populations as well. The very wet and cool early spring may have slowed their seasonal cycle but probably had generally positive effects for lizards. In contrast, the protracted wet and cold weather of late summer and fall likely resulted in negative impacts for lizard populations. The limited data collected in 2002 added relatively little to the data collected in 2001. However, low overall success in the confirmation of presence, even on sites previously documented as having lizard captures, suggests the entire population of short-horned lizards in Alberta has contracted.

4.0 POPULATION TRENDS

As a result of the limited information gathered in 2002, any estimates of population trend or provincial changes in distribution put forth this year must be primarily based on the information collected in 2001 and previous years. Estimated capture rates from the 2001 season, at around 2 hours 20 minutes per capture, were similar to those from earlier studies by Powell (pers. comm.) who estimated he spent about 3 hours searching per capture. From this information it was suggested that populations seem generally stable in the locations in which they persist. Short-horned lizard populations in Alberta are scattered and of low density. Very low capture rates result in low sample sizes and correspondingly high levels of uncertainty in any population calculations. As no reliable population estimates have been put forth for any site, it is difficult to assess whether or not any single population is undergoing some sort of fluctuation, let alone all populations within the province. Estimating an accurate numerical value for the provincial population is therefore not a rational pursuit. That being said however, some sort of population estimate for this species has been repeatedly asked for

as an aid to status designation. For this reason, an attempt to vaguely quantify the provincial population along the following line of reasoning is put forth:

There are 74 sections of land upon which short-horned lizards have been reported. Of these, 6 sections have undergone extensive habitat alteration that has likely caused a local extirpation of any previous lizard population and have been discounted as currently being suitable for short-horned lizards. Therefore, 68 of the original 74 sections possess potentially viable habitat. From the 2001 survey it was calculated that where lizards were captured, the average density was approximately 1 lizard per 4.8 km^2 or about 2 lizards per ha. As each section consists of about 49.2 km^2 then the total recorded potential habitat is around 3345.6 km^2. If the total potential land area of 3345.6 km^2 is then divided by the approximate area searched per capture of 4.8 km^2 the outcome is 697 possible captures over the entire recorded distribution. This calculation of course presumes a consistent lizard density, which is highly unlikely. It also assumes that populations of lizards remain on all previously recorded sections with even remnant habitat, which is also improbable. The last assumption is that we simply were unsuccessful at making captures at most sites, which seems unlikely. This is not intended to say the number is completely impossible, but simply to point out the flaws in such a calculation.

Short-horned lizards are notoriously difficult to find. Their small size, cryptic colouration, and habit of remaining motionless is very effective as camouflage. It is very likely that the capture density estimated of one lizard per 4.8 km^2 is low relative to actual density. If it is supposed that we captured one lizard in 10 in the searched area, then the highest probable population, over the entire recorded habitable distribution of 3345.6 km^2 is still only 6970 lizards. It must be kept in mind that as a population estimate this number (6970) may in fact be misleadingly high, as these captures were attained during the peak of the reproductive season and should be considered to represent population maximums. Therefore in the author's estimation the total population of short-horned lizards in Alberta is unlikely to be more than 10,000 mature individuals. Short-horned lizard populations appear to be both sparse and isolated. Once a sub-population has been lost, it is highly improbable that recolonization will occur both because of the vast distance between sites and restricted dispersal capabilities of lizards.

The above notwithstanding, it is worth noting that it is also highly improbable that all possible habitat in southeastern Alberta has been included in this estimation. Eleven additional sections of land, most of them adjacent to or nearby recorded locations, were also searched. Of these, lizards were captured on three. There is a strong probability that some populations of lizards range over a larger area than the isolated sections that they have been recorded on, especially if the habitat on surrounding lands is favourable. Other populations may have simply never been noticed or recorded. Any estimate of the land area that may contain potential habitat would have to rely upon more broad scale habitat evaluation, which is outside the scope of this survey. Such an overview of the available habitat across southeastern Alberta would probably best be achieved using satellite imagery or aerial photos of promising potential sites.

While persisting populations may appear generally stable, it is worth pointing out that since apparent distribution-wide declines have, without a doubt, resulted from human activity, such as cultivation, further expansion of similar activities will almost certainly produce corresponding declines in this species. Changes in land use, in particular the recent burst of oil and gas development in southeastern Alberta with the corresponding increase in well sites, pipelines, roads and traffic activity, and the relatively slow but steady effects of cultivation, have likely contributed to the apparent loss of populations at some of the previously recorded sites. The effects of climatic extremes experienced in this area over the past few years – drastic drought followed by astonishing precipitation, and a cold, wet fall – may also have had negative impacts on lizard populations. The degree to which each of these separate factors contributed to the cumulative impact on lizard populations in Alberta is unknown.

Evidence to illustrate an apparent decline in this species includes a lack of captures at some key sites. For example, no lizards were captured in 2001, despite good conditions and a lengthy search, at the Mitchell Ranch, north of Medicine Hat. This site is potentially a good barometer of provincial lizard populations in general, as it is the most northern of all known sites in Canada and is therefore predicted to experience the most extreme climate of occupied sites. It is a large, mainly unbroken tract of relatively healthy native grasslands, with a suitably complex topography and vegetation. The primary land use is as livestock pasture. However, it has recently also been the focus of significant oil and gas development, with the accompanying roads and soil disturbance. There have been several records of lizard captures at this site, with some as recently as 1997. It seems alarming that our searches yielded no captures at this site.

Similarly, we failed in 2001to capture lizards at the Audet Ranch (last record 1977) located along the United States border and at the westernmost extreme of the recorded provincial lizard distribution. A search of the Onefour site in 2001 (records ranging from 1950 to 1984) similarly failed to produce captures. Finally, one other significant site, at Comrey, previously documented as well-populated (Powell and Russell, 1992), also failed to yield lizards in 2001 in spite of good conditions and adequate search effort. All of these sites would appear to generally have good, relatively large tracts of habitat available. Each should represent some of the least disturbed lizard populations in Alberta, although oil and gas development at the Mitchell site, and some cultivation at the Audet site are obvious alterations. Other than these possibilities, it is not clear why these 'indicator' sites were unfruitful.

In some cases, causes of extirpation seem more evident. A number of the previously recorded sites may have experienced dramatic ecological revisions since the original records. For example, the Wildhorse site (last record 1962) is now primarily irrigated and cultivated land. As another example, the Manyberries townsite has a number of BSOD records dating from 1925 to 1977. However, appropriate habitat in the immediate townsite area currently appears improbable.

Lizards were captured on only 19 of the 59 sections (32.2 %) searched in 2001/2002. It may be surmised that such failures to locate lizards at previously recorded locations indicates a

general decline of lizard populations across Alberta. A general contraction of distribution for a prairie species is not entirely surprising, as settlement has brought many dramatic ecological alterations to southeastern Alberta in the past century. Perhaps the small size and relative obscurity of short-horned lizards have shielded them from the earlier widespread declines of most larger species, with their larger home-range requirements, until relatively recently. Human effects on the area may have been relatively impotent for short-horned lizards until the past quarter century or so. Long-time residents familiar with short-horned lizards often comment that they do not seem as common as they once were. Any decline in lizard populations is almost certainly the outcome of cumulative human impacts on the landscape, perhaps in combination with recent climatic aberrations, all ultimately resulting in a more ecologically disturbed environment. This has proven a common story across the prairie ecosystem.

5.0 MANAGEMENT IMPLICATIONS AND FUTURE DIRECTIONS

The search effort of 2002 was relatively ineffective when compared with that of 2001 due to unseasonal weather conditions. Since the results of this year's survey were so restricted, any estimates of population trends must essentially be taken from the 2001 survey effort. Estimated capture rates in 2001 were comparable with previous search efforts (Powell pers. comm.) and it is upon this understanding that it is inferred that generally, populations appear relatively stable within those sites where they have been confirmed to persist.

Of the 74 sections of land with previous lizard observations, 48 were searched to some extent, over the summers of 2001 and 2002. When only the sections where lizards were previously recorded are considered, the ratio of lizard captures per section searched was relatively low (16/48 = 33.3 %). This relatively low rate of confirmation of presence would suggest the distribution of short-horned lizards in Alberta has declined. When taken as a whole, both anecdotal and search effort information seem to indicate an overall contraction of the distribution of this species across Alberta. A reduction in overall distribution is not surprising, given cumulative levels of human activity in the region, but does not bode well for the long-term persistence of this species.

Most of the following recommendations were previously put forth in the first report (James, 2002) and some were even suggested by Powell and Russell (1992, 1993) but bear repeating. It remains strongly suggested that a limited number of sites, perhaps 10 or so, that are widespread across the distribution of the species in Alberta, be chosen for a long-term annual survey effort. Once these sites are chosen, it is recommended that a limited number of individuals be responsible for implementation of the project over the long term. This suggestion is primarily intended to enhance landowner confidence in such a survey, which is crucial for such an undertaking. It is also significant in terms of precision of replication and the utility of the resulting data. Consistency and repeatability of data collection are ultimately vital to achieving meaningful results. To augment such a survey effort, it would also be useful to initiate once-per-decade surveys at a number of the remaining sites that are not to be surveyed annually. Vegetative monitoring of inhabited areas would also be helpful information, as it would provide further insights into the impact of environmental conditions. Permanent marking of individual animals (i.e. toe-clips, sub-cutaneous bar code chips, etc.) would likely result in much more valuable data as well. The use of GPS units to quickly and

easily identify, to within a small area, the location of individuals, has made locating an area where previous captures were made a much simpler task and should improve capture rates. Theoretically, this would notably reduce the amount of time spent searching large, vaguely described areas for lizards and help to narrow identification of habitat requirements. Therefore it is anticipated that such a concise, limited, but annually repeated survey effort could yield a great deal of important information for more accurately assessing the status of the species in Alberta within a very reasonable budget.

Other management implications include continued vigilance, prior to industrial activity, for presence of this species. Avoidance of vehicular traffic or any other significant disturbance on south-facing slopes and areas adjacent to such appropriate habitat, especially in regions potentially inhabited by lizards, is prudent. For details on suggestions for industrial protocol or mitigation within the range of short-horned lizards in Alberta, see Appendices A and B of James (2002).

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